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(54) INTELLIGENT SYNCHRONIZATION OF MEDIA PLAYER WITH HOST COMPUTER

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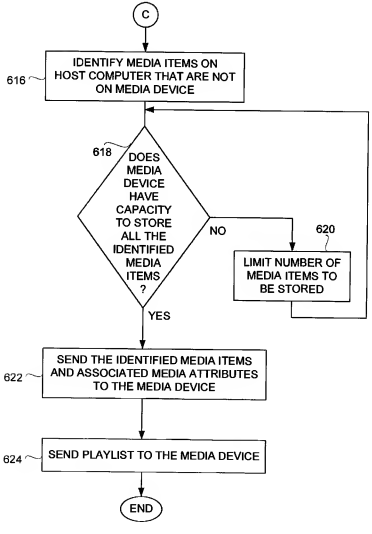
(57) ABSTRACT

Improved techniques for synchronization of media contents stored on a media player with media contents stored on a host computer are disclosed. According to one aspect, synchronization can be automatically initiated and performed upon connection of a data link between the media player and the host computer. According to another aspect, synchronization is able to be achieved with a reduced amount of data transfer between the host computer and the media device.



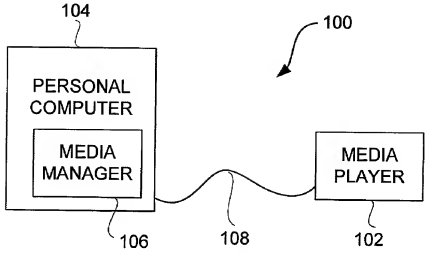

104
100
PERSONAL COMPUTER
MEDIA MANAGER
MEDIA PLAYER
106
108
102

FIG. 1

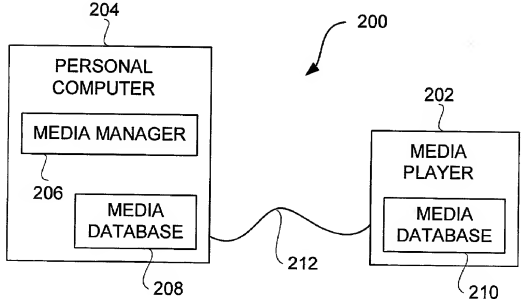

204
200
PERSONAL COMPUTER
MEDIA MANAGER
206
MEDIA DATABASE
208
212
202
MEDIA PLAYER
MEDIA DATABASE
210

FIG. 2

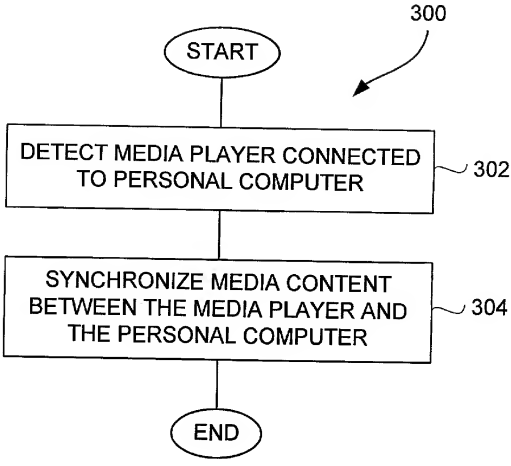

300
START
DETECT MEDIA PLAYER CONNECTED TO PERSONAL COMPUTER
302
SYNCHRONIZE MEDIA CONTENT BETWEEN THE MEDIA PLAYER AND THE PERSONAL COMPUTER
304
END

FIG. 3

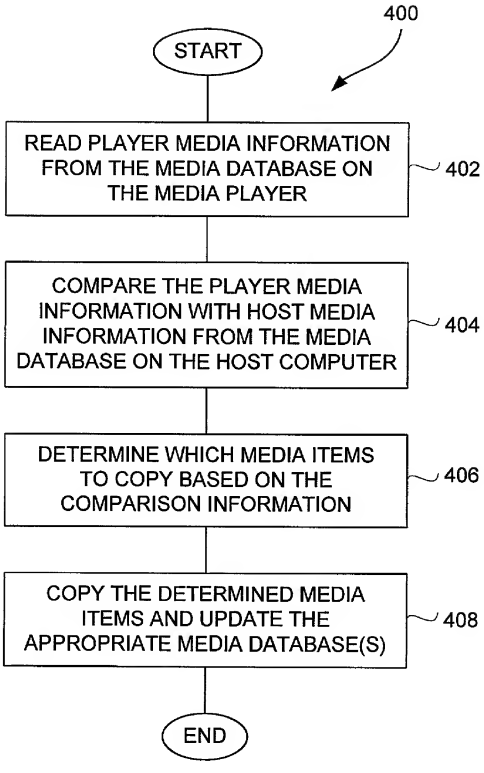

400
START
READ PLAYER MEDIA INFORMATION FROM THE MEDIA DATABASE ON THE MEDIA PLAYER
402
COMPARE THE PLAYER MEDIA INFORMATION WITH HOST MEDIA INFORMATION FROM THE MEDIA DATABASE ON THE HOST COMPUTER
404
DETERMINE WHICH MEDIA ITEMS TO COPY BASED ON THE COMPARISON INFORMATION
406
COPY THE DETERMINED MEDIA ITEMS AND UPDATE THE APPROPRIATE MEDIA DATABASE(S)
408
END

FIG. 4

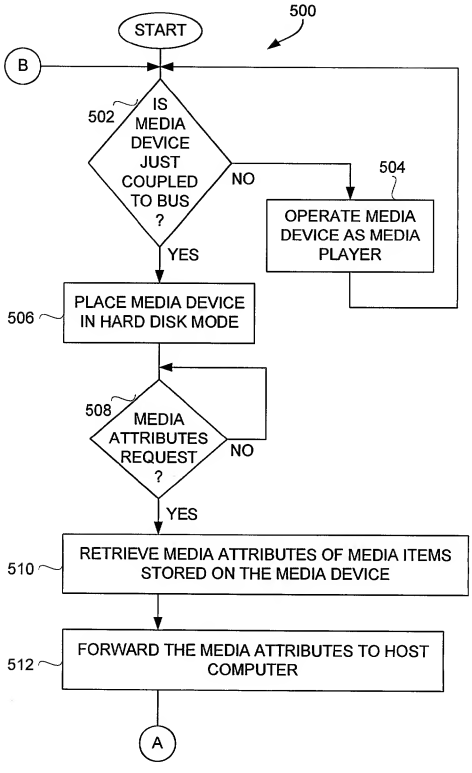

500
START
B
502
IS MEDIA DEVICE JUST COUPLED TO BUS ?
NO
504
OPERATE MEDIA DEVICE AS MEDIA PLAYER
YES
506
PLACE MEDIA DEVICE IN HARD DISK MODE
508
MEDIA ATTRIBUTES REQUEST ?
NO
YES
510
RETRIEVE MEDIA ATTRIBUTES OF MEDIA ITEMS STORED ON THE MEDIA DEVICE
512
FORWARD THE MEDIA ATTRIBUTES TO HOST COMPUTER
A

FIG. 5A

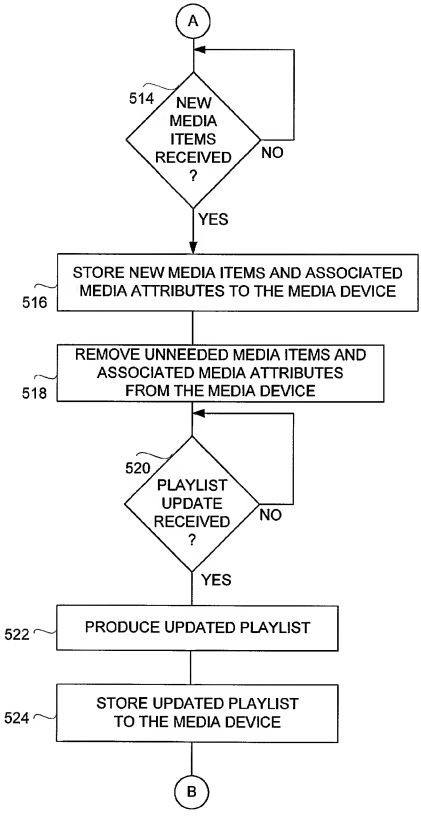

A
514
NEW MEDIA ITEMS RECEIVED ?
NO
YES
STORE NEW MEDIA ITEMS AND ASSOCIATED MEDIA ATTRIBUTES TO THE MEDIA DEVICE
516
REMOVE UNNEEDED MEDIA ITEMS AND ASSOCIATED MEDIA ATTRIBUTES FROM THE MEDIA DEVICE
518
520
PLAYLIST UPDATE RECEIVED ?
NO
YES
PRODUCE UPDATED PLAYLIST
522
STORE UPDATED PLAYLIST TO THE MEDIA DEVICE
524
B

FIG. 5B

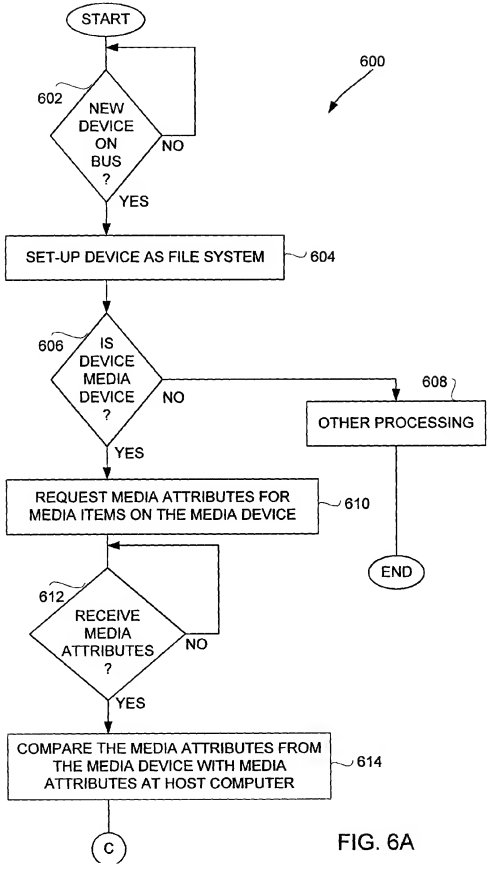

START
600
602
NEW DEVICE ON BUS ?
NO
YES
SET-UP DEVICE AS FILE SYSTEM
604
606
IS DEVICE MEDIA DEVICE ?
NO
608
OTHER PROCESSING
YES
REQUEST MEDIA ATTRIBUTES FOR MEDIA ITEMS ON THE MEDIA DEVICE
610
END
612
RECEIVE MEDIA ATTRIBUTES ?
NO
YES
COMPARE THE MEDIA ATTRIBUTES FROM THE MEDIA DEVICE WITH MEDIA ATTRIBUTES AT HOST COMPUTER
614
C

FIG. 6A

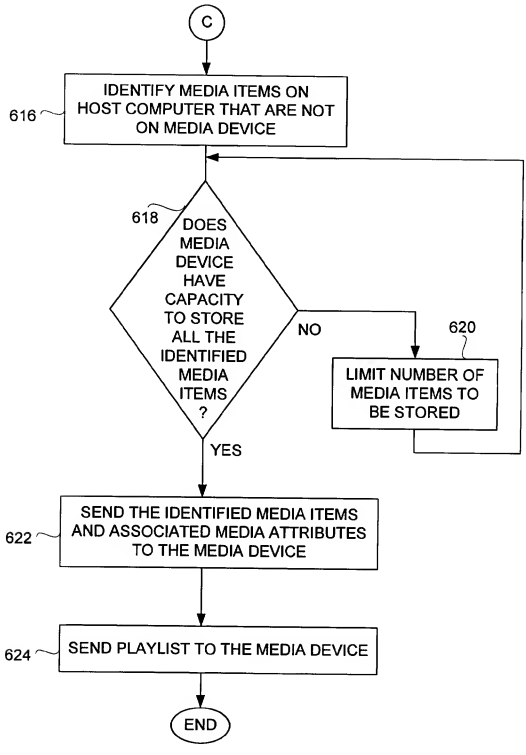

C
IDENTIFY MEDIA ITEMS ON HOST COMPUTER THAT ARE NOT ON MEDIA DEVICE
616
618
DOES MEDIA DEVICE HAVE CAPACITY TO STORE ALL THE IDENTIFIED MEDIA ITEMS ?
NO
620
LIMIT NUMBER OF MEDIA ITEMS TO BE STORED
YES
SEND THE IDENTIFIED MEDIA ITEMS AND ASSOCIATED MEDIA ATTRIBUTES TO THE MEDIA DEVICE
622
SEND PLAYLIST TO THE MEDIA DEVICE
624
END

FIG. 6B

INTELLIGENT SYNCHRONIZATION OF MEDIA PLAYER WITH HOST COMPUTER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority of U.S. Provisional Application No. 60/346,235, filed Oct. 22, 2001, and entitled "INTELLIGENT SYNCHRONIZATION OF MEDIA PLAYER WITH HOST COMPUTER," which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to media devices and, more particularly, to synchronization or management of media on media devices.

[0004] 2. Description of the Related Art

[0005] Synchronization operations have been conventionally performed between portable devices, such as Personal Digital Assistants (PDAs) and host computers, to synchronize electronic files or other resources. For example, these files or other resources can pertain to text files, data files, calendar appointments, emails, to-do lists, electronic rolodexes, etc. However, such synchronization schemes tend to utilize filenames and modification dates to determine whether files need to be copied between the devices. These synchronization schemes can be largely automated but nevertheless have to be manually initiated.

[0006] In the case of media players, such as MP3 players, files are typically moved between a host computer and a media player through use of a drag and drop operation, like is conventionally done with respect to copying of a data file from a Windows desktop to a floppy disk. Hence, the user of the media player manually initiates the synchronization for individual media items. As a consequence, synchronization tends to be tedious and time consuming for users. Synchronization tends to be slow because data is transmitted between devices over a slow link.

[0007] Thus, there is a need for improved techniques for improved approaches to synchronize media devices and host computers.

SUMMARY OF THE INVENTION

[0008] Broadly speaking, the invention relates to synchronization of media contents stored on a media player with media contents stored on a host computer (e.g., personal computer). According to one aspect of the invention, synchronization can be automatically initiated and performed upon connection of a data link between the media player and the host computer. According to another aspect of the invention, synchronization is able to be achieved with a reduced amount of data transfer between the host computer and the media device.

[0009] The invention can be implemented in numerous ways, including as a method, system, device, apparatus, or computer readable medium. Several embodiments of the invention are discussed below.

[0010] As a method for synchronizing media contents of a media player with a host computer, one embodiment of the invention includes at least the acts of: detecting connection of a media player to the host computer; and automatically synchronizing media content between the media player and the host computer once the connection has been detected.

[0011] As a method for synchronizing media items of a media player with a host computer, where the media player has a first media database storing player media information and where the host computer has a second media database storing host media information, one embodiment of the invention includes at least the acts of: reading the player media information from the first media database provided on the media player; comparing the player media information with the host media information from the second media database provided on the host computer, the comparing producing comparison information; determining which media items are to be copied between the media player and the host computer based on the comparison information; and copying the determined media items to perform the synchronization.

[0012] As a method for synchronizing media items of a media player with a host computer, where the media player storing player media information and where the host computer storing host media information, another embodiment of the invention includes at least the acts of: reading the player media information from the media player; comparing the player media information with the host media information from the host computer to produce comparison information; determining which media items are to be copied between the media player and the host computer based on the comparison information; and copying the determined media items to perform the synchronization.

[0013] As a portable media player, one embodiment of the invention includes at least: a storage disk that stores a plurality of media items; a user input device that enables a user of the portable media player to at least select a particular media item from the plurality of media items; a cache memory capable of storing at least one of the media items; a media database that stores characteristics information for the media items stored to the storage disk and the cache memory; and a processor that controls the portable media player to store, remove and play the media items.

[0014] As a media device, one embodiment of the invention pertains to a media player, wherein the improvement comprises a media database provided within the media player, with the media database storing media information about media items stored on the media player.

[0015] As a computer readable medium including at least computer program code for synchronizing media contents of a media player with a host computer, one embodiment of the invention includes at least: computer program code for detecting connection of a media player to the host computer; and computer program code for automatically synchronizing media content between the media player and the host computer once the connection has been detected.

[0016] As a computer readable medium including at least computer program code for synchronizing media items of a media player with a host computer, the media player storing player media information, and the host computer storing host media information, one embodiment of the invention includes at least: computer program code for reading the player media information from the media player; computer

program code for comparing the player media information with the host media information from the host computer to produce comparison information; computer program code for determining which media items are to be copied between the media player and the host computer based on the comparison information; and computer program code for copying the determined media items to perform the synchronization.

[0017] Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

[0019] **FIG. 1** is a block diagram of a synchronization system according to one embodiment of the invention.

[0020] **FIG. 2** is a block diagram of a media synchronization system according to one embodiment of the invention.

[0021] **FIG. 3** is a flow diagram of media manager processing according to one embodiment of the invention.

[0022] **FIG. 4** is flow diagram of synchronization processing according to one embodiment of the invention.

[0023] **FIGS. 5A and 5B** illustrate media device synchronization processing according to one embodiment of the invention.

[0024] **FIGS. 6A and 6B** are flow diagrams of host computer synchronization processing according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] The invention relates to synchronization of media contents stored on a media player with media contents stored on a host computer (e.g., personal computer). According to one aspect of the invention, synchronization can be automatically initiated and performed upon connection of a data link between the media player and the host computer. According to another aspect of the invention, media player **102** to the personal computer **104** over the peripheral cable **108**, and vice versa.

[0026] In one embodiment, the media player is a portable computing device dedicated to processing media such as audio, video or images. For example, the media player **102** can be a music player (e.g., MP3 player), a game player, a video player, a video recorder, a camera, an image viewer and the like. These devices are generally battery operated and highly portable so as to allow a user to listen to music, play games or video, record video or take pictures wherever the user travels. In one implementation, the media player is a handheld device that is sized for placement into a pocket or hand of the user. By being handheld, the media player is relatively small and easily handled and utilized by its user. By being pocket sized, the user does not have to directly carry the device and therefore the device can be taken almost anywhere the user travels (e.g., the user is not limited by carrying a large, bulky and often heavy device, as in a portable computer). Furthermore, the device may be operated by the users hands, no reference surface such as a desktop is needed.

[0027] **FIG. 2** is a block diagram of a media synchronization system **200** according to one embodiment of the invention. The media synchronization system **200** includes a media player **202** and a personal computer **204**. The personal computer **204** includes a media manager **206**. The personal computer **204** further includes a media database **208**. The media player **202** includes a media database **210**. Typically, the media player **202** will also include a data storage device (e.g., disk drive) for storing media content, a cache memory for storing media content in-use, a screen display for displaying information to a user, and a processor (e.g., microprocessor) for controlling operation of the media player **202**.

[0028] A peripheral cable **212** provides a data path (or data link) between the media player **202** and the personal computer **204**. The peripheral cable **212** provides a peripheral bus that couples the media player **202** to the personal computer **204**. The peripheral bus, for example, could be a FIREWIRE bus or a Universal Serial Bus (USB). A synchronization operation between the media content stored on the personal computer and the media content stored on the media player **204** can be achieved in a sophisticated manner through comparison of media information stored in the respective media databases **208** and **210**. When comparison of the media information from the respective databases **208** and **210** indicates that there is a particular media item resident on the personal computer **204** but not on the media player **202**, then the particular media item can be transmitted (downloaded) to the media player over the peripheral cable **212**. On the other hand, when the comparison of the media information from the respective databases **208** and **210** indicates that a particular media item is resident on the media player **202** but not on the personal computer **204**, then the particular media item can be either removed (deleted) from the media player **202** or transmitted (e.g., uploaded) over the peripheral cable **212** to the personal computer **204**. Hence, by providing the media player **202** with the media database **210**, more sophisticated synchronization and management of media content is enabled.

[0029] The media database **210** also allows the media player **202** to present a user interface to the user that is more sophisticated then conventional approaches. Such a user interface can be presented on the screen display of the media player **202**. The user interface can, for example, allow the user of the media player **202** to browse, sort, search, play, etc. the media content resident on the media player **202**. The user interface can also allow the user of the media player **202** to download (add) or delete (remove) media items from the media player **202**. The media manager **206** also has a user interface that allows a user to browse, sort, search, play, make playlists, burn Compact Discs (CDs), etc. the media content resident on the personal computer **204**. The user interface can also allow the user of the personal computer **204** to download (add) or delete (remove) media items from the personal computer **204**. In one embodiment, the media manager **206** and its associated user interface are provided by iTunes, version 2.0, from Apple Computer, Inc. of Cupertino, Calif.

[0030] **FIG. 3** is a flow diagram of media manager processing **300** according to one embodiment of the invention. The media manager processing **300** is, for example, performed by the media manager **106** illustrated in **FIG. 1** or the media manager **206** illustrated in **FIG. 2**.

[0031] The media manager processing **300** initially detects **302** a media player connected to a personal computer (host computer). Here, when a media player is connected to the personal computer, a synchronization operation can be performed to synchronize the media content between the media player and the personal computer. After the media player has been detected as being connected to the personal computer, the media content between the media player and the personal computer can be synchronized **304**. The synchronization can be performed in a one-way manner or in a two-way manner. In a preferred embodiment, the synchronization is one-way from the personal computer to the media player. In another embodiment, the synchronization can be one-way from the media player to the personal computer. In still another embodiment, the synchronization can be two-way from the media player to the personal computer as well as from the personal computer to the media player. In any case, the media player typically has less media storage capacity than the personal computer and thus may limit the extent of the synchronization that can be performed. The synchronization processing can be performed manually assuming that a media player has already been detected **302** or automatically upon such detection. In the case of automatic synchronization following detection **302** of the connection, synchronization is performed without a user interacting with any buttons or user interface elements, that is, the connection itself initiates the synchronization.

[0032] **FIG. 4** is flow diagram of synchronization processing **400** according to one embodiment of the invention. The synchronization processing **400** is, for example, performed by a host computer, such as the personal computer **104** illustrated in **FIG. 1** or the personal computer **204** illustrated in **FIG. 2**. More specifically, the synchronization processing **400** is performed by the media manager **106** illustrated in **FIG. 1** or the media manager **206** illustrated in **FIG. 2**.

[0033] The synchronization processing **400** initially reads **402** player media information from a media database on a media player. Next, the player media information is compared **404** with first media information from a media database on a host computer. Such comparison produces comparison information concerning differences between the player media information and the host media information. Next, the synchronization processing **400** determines **406** one or more media items to copy between the host computer and the media player based on the comparison information. For example, media items (e.g., audio files for songs) can be compared using media information such as song title, album name and/or artist name which pertain to characteristics or attributes of the media items. Thereafter, the determined one or more media items are copied **408** and the appropriate media database(s) are updated. Following the operation **408**, the synchronization processing **400** is complete and ends.

[0034] According to one embodiment, the comparison of player media information and host media information is performed using media attributes of the various media items. Namely, a media item on the media player can be deemed the same media item as resident on the host computer if its media attributes sufficiently match. Examples of media attributes include title, album, track, artist, composer and genre. These attributes are particular to a particular media item. In addition, other media attributes can pertain to quality characteristics of the media item. Examples of such media attributes include bit rate, sample rate, equalization setting, volume adjustment, start/stop and total time. Hence, in one embodiment, if the above-identified media attributes pertaining to a media item on the media player all match those same media attributes pertaining to a media item on the host computer, then the two media items stored on different devices can be deemed the same even though still further attributes or characteristics may cause these media items to not be exact duplications of one another. For example, if modification dates associated with respective files storing the media items were different, this difference in modification date would not trigger the copying of such media items from the host computer to the media player when the above-identified media attributes match.

[0035] Hence, the intelligence of the synchronization processing of the invention allows the amount of data transfer to be properly managed such that it is relatively low or minimized. Although conventional approaches are able to transfer files from a host computer to a portable device, when dealing with media items, filenames and modification dates tend not to be reliable indicators of whether data transfer needs to be transferred (i.e., copied). As a result, using conventional data transfer techniques with respect to media items results in slow and inefficient operation and thus tends to present an unsatisfactory user experience.

[0036] Although the synchronization processing **400** makes use of media databases at the host computer and the media player, in another embodiment. The needed host media information and the player media information can be gathered from the media items themselves. In one implementation, such media information can be acquired from metadata provided with the media items. However, by providing the media databases, synchronization is able to be performed more efficiently and quickly.

[0037] **FIGS. 5A and 5B** illustrate media device synchronization processing **500** according to one embodiment of the invention. The media device synchronization processing **500** is performed by a media device that interacts with a host computer over a network. For example, the media device can pertain to the media player **102** illustrated in **FIG. 1** or the media player **202** illustrated in **FIG. 2**.

[0038] The media device synchronization processing **500** is generally operative on the media device when the media device is powered-on. Initially, a decision **502** determines whether the media device has just been coupled to a bus. The decision **502** can be performed periodically to check for a recent connection to a bus or can be triggered by hardware detection of connection to a bus. The bus is a communication bus coupled to the host computer. In one embodiment, the bus is a serial bus such as FIREWIRE or Universal Serial Bus (USB). When the decision **502** determines that the media device has not just been coupled to a bus, then the media device is operated **504** as a media player. In such a mode, the media device operates to browse, search or play media items for its user. The media items can be audio items (e.g., songs). Following the operation **504**, the media device synchronization processing **500** returns to repeat the decision **502** and subsequent operations.

[0039] On the other hand, when the decision **502** determines that the media device has just been coupled to the bus, then the media device is placed in a hard disk mode. In the hard disk mode, the media device acts as an external hard drive to the host computer. A decision **508** then determines whether the host computer has requested media attributes for the media items residing on the media device. When the decision **508** determines that the host computer is not requesting media attributes, the media device can, but need not, perform other hard drive operations for non-synchronization purposes (not shown). When the decision **508** determines that the host computer is requesting media attributes (i.e., such as through a read operation), then the media attributes of the media items stored on the media device are retrieved **510**. After the media attributes are retrieved **510**, the media attributes are forwarded **512** to the host computer.

[0040] Next, a decision **514** determines whether new media has been received at the media device from the host computer. In other words, in an effort to synchronize the media content residing on the media device with the media content residing at the host computer, the media device will often receive media content from the host computer. Hence, the decision **514** determines whether new media items have been or are presently being received. When the decision **514** determines that such new media items have not been received, then the media device synchronization processing **500** can await such new media items. While waiting for new media items, the media device can, but need not, perform other hard drive operations for non-synchronization purposes (not shown). More generally, other hard disk operations can occur concurrently with synchronization operations. On the other hand, when the decision **514** determines that new media items have been received from the host computer, then the new media items and their associated media attributes are stored **516** to the media device. In one embodiment, the new media items are stored to files in the media device, and the associated media attributes pertaining to the media items are stored in a media database residing on the media device. Additionally, any unneeded media items and their associated media attributes can be removed **518** from the media device. Hence, in this embodiment, by synchronizing the media content residing on the media device with that on the host computer, new media items are not only stored to the media device, but unneeded (e.g., old) media items and their associated media attributes are also removed from the media device.

[0041] Following the operation **518**, a decision **520** determines whether a playlist update has been received. When the decision **520** determines that a playlist update has not been received, then the media device synchronization processing **500** can await such a playlist update. Alternatively, when the decision **520** determines that a playlist update has been received, then an updated playlist for the media device is produced **522**. The playlist update could be the updated playlist or could be instructions to update an existing playlist. The updated playlist is then stored **522** to the media device.

[0042] In effect, one or more playlists at the host computer can be synchronized with the media device and thus made available to the media device. A playlist identifies particular media items that are to be played in a sequence. Internally, the playlist can be represented in the media database as a data structure that points to files of the appropriate media items residing on the storage device within the media device. Hence, for a given playlist, the pointers to the files of the appropriate media items on the media device will differ from the pointers to the files for the same media items on the host computer, thus the need to update the pointers if a particular playlist is moved between the host computer and the media device.

[0043] **FIGS. 6A and 6B** are flow diagrams of host computer synchronization processing **600** according to one embodiment of the invention. The host computer synchronization processing **600** is, for example, performed by a host computer. The host computer can, for example, be the personal computer **104** illustrated in **FIG. 1** or the personal computer **204** illustrated in **FIG. 2**.

[0044] The host computer synchronization processing **600** begins with a decision **602** which monitors a bus (i.e., peripheral bus) to determine whether any new devices have been attached. In one implementation, the monitoring is limited to a particular category of devices (e.g., FIREWIRE devices). Such monitoring can, for example, be performed by polling the device(s) on the bus or by receiving a new device alert. When the decision **602** determines that no new devices have been attached to the bus, then the host computer synchronization processing **600** awaits the presence of a new device. Once the decision **602** determines that a new device is present on the bus, then the device is set up **604** as a file system with respect to the host computer. As such, an operating system for the host computer is able to access (read, write and delete) files with respect to the file system (i.e., the new device).

[0045] Next, a decision **606** determines whether the device that is now present on the bus is a media device. When the decision **606** determines that the device is not a media device, then other processing **608** can be performed. Such other processing **608** is unrelated to synchronization processing and thus not further described herein. Following the other processing **608**, the host computer synchronization processing **600** is complete and ends with synchronization not having been performed.

[0046] On the other hand, when the decision **606** determines that the device is a media device, then media attributes for media items on the media device are requested **610**. Typically, the media attributes for all the media items residing on the media device would be retrieved. A decision **612** then determines whether the media attributes have been received. When the decision **612** determines that the media attributes have not yet been received, then the host computer synchronization processing **600** can await their receipt. Once the decision **612** determines that the media attributes have been received, then the media attributes from the media device are compared **614** with media attributes for the media items residing on the host computer. Here, the comparison **614** of media attributes with respect to the media device and the host computer results in comparison information. The comparison information indicates directly or indirectly which media items are present at the host computer but not present at the media device as well as which media items are present at the media device but not present at the host computer. Following the comparing **614**, the media items on the host computer that are not on the media device are identified **616**.

[0047] Next, a decision **618** determines whether the media device has the capacity to store all the identified media items. Here, the decision **618** determines whether the media device has sufficient storage capacity to store the one or more media items that have been identified **616** as on the host computer but not on the media device. When the decision **618** determines that the media device does not have sufficient capacity, then the number of media items to be stored is limited **620**. There are numerous ways to limit the number of media items to be stored. For example, one or more of the media items to be stored can be unidentified such that it is not to be stored to the media device. The one or more media items to be unidentified can be chosen in a variety of different ways. For example, the one or more items to be unidentified could be randomly selected, selected based on file size, selected based on position in playlist, etc. Following the operation **620**, the host computer synchronization processing **600** returns to repeat the decision **618** and subsequent operations.

[0048] When the decision **618** determines that the media device has sufficient capacity to store all of the identified media items, the identified media items and their associated media attributes are sent to the media device. Here, the remaining identified media items and their associated media attributes are sent (i.e., copied) from the host computer to the media device where they are to be stored. A playlist can also be sent **624** to the media device. The playlist can represent a new playlist or an updated version of a previously existing playlist. Before sending **624** the playlist to the media device, the playlist can be modified for use on the media device. Alternatively, the media device itself could update the playlist for use on the media device.

[0049] Additionally, although not illustrated in **FIGS. 6A and 6B**, according to another embodiment, the host computer synchronization processing **600** at operation **614** can also identify those of the media items on the media device that are not on the host computer. Then, the host computer can operate to interact with the media device to remove (e.g., delete) those media items stored on the media device that are not stored at the host server. Such additional processing would be performed after the operation **616** and prior to the decision **618** so that the storage capacity of the media device can be fully utilized.

[0050] The media device synchronization processing **500** and the host computer synchronization processing **600** interact to synchronize media items on the media device to those media items on the host computer. Such synchronization can consider all media items or can be limited to synchronizing only a subset of media content, such as media items pertaining to one or more playlists. The media attribute comparison provided by the invention is facilitated through the use of databases, both on the host computer and on the media device.

[0051] In one implementation, the host computer synchronization processing **600** can utilize an application resident on the host computer to perform the comparison and updating of the media items and their attributes between the host computer and the media device. One such application is iTunes, version 2.0, produced by Apple Computer, Inc. of Cupertino, Calif.

[0052] The various aspects or features of the invention described above can be used alone or in various combinations.

[0053] Although the media items of emphasis in several of the above embodiments where audio items (e.g., audio files or songs), the media items are not limited to audio items. For example, the media item can alternatively, pertain to videos (e.g., movies) or images (e.g., photos).

[0054] The invention is preferably implemented by software, but can also be implemented in hardware or a combination of hardware and software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[0055] The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. One advantage of the invention is that a user is able to synchronize a media player with a host computer in a more sophisticated manner. Another advantage of the invention is that the amount of data transfer required for synchronization is reduced thus enabling faster synchronization. Still another advantage of the invention is that synchronization can be automatically initiated and performed upon connection of a media player to a host computer.

[0056] The many features and advantages of the present invention are apparent from the written description and, thus, it is intended by the appended claims to cover all such features and advantages of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, the invention should not be limited to the exact construction and operation as illustrated and described. Hence, all suitable modifications and equivalents may be resorted to as falling within the scope of the invention.

What is claimed is:

1. A method for synchronizing media contents of a media player with a host computer, said method comprising:

detecting connection of a media player to the host computer; and

automatically synchronizing media content between the media player and the host computer once the connection has been detected.

2. A method as recited in claim 1, wherein the connection is provided by a data link between the media player and the host computer.

3. A method as recited in claim 1, wherein the media player includes a media database storing player media information, and wherein the host computer includes a media database storing host media information.

4. A method as recited in claim 1, wherein said synchronizing is based on a comparison of the player media information with the host media information.

5. A method as recited in claim 1, wherein the media player is a portable media player.

6. A method as recited in claim 1, wherein the media player comprises an audio player, and wherein the media content includes at least audio files of songs.

7. A method as recited in claim 1, wherein the media player comprises a video player, and wherein the media content includes at least video files of videos.

8. A method as recited in claim 1, wherein the media player comprises an image viewer, and wherein the media content includes at least image files of images.

9. A method for synchronizing media items of a media player with a host computer, the media player having a first media database storing player media information, and the host computer having a second media database storing host media information, said method comprising:

reading the player media information from the first media database provided on the media player;

comparing the player media information with the host media information from the second media database provided on the host computer, said comparing producing comparison information;

determining which media items are to be copied between the media player and the host computer based on the comparison information; and

copying the determined media items to perform the synchronization.

10. A method as recited in claim 9, wherein said method further comprises:

identifying media items to be removed from the media player based on the comparison information; and

removing the identified media items from the media player.

11. A method as recited in claim 10, wherein the identified media items are those media items on the media player but not on the host computer.

12. A method as recited in claim 9, wherein said method further comprises:

updating one or both of the first and second media databases.

13. A method as recited in claim 9, wherein said comparing operates to compare at least song title, album name and artist name.

14. A method as recited in claim 13, wherein said comparing operates to further compare quality characteristics of media items.

15. A method as recited in claim 14, wherein the quality characteristics include at least one of bit rate, sample rate, equalization setting, volume adjustment, start/stop and total time.

16. A method as recited in claim 9, wherein the media player is a pocket-sized media player.

17. A method as recited in claim 9, wherein the media player is an MP3 player, and wherein the media items include at least audio files of songs.

18. A method for synchronizing media items of a media player with a host computer, the media player storing player media information, and the host computer storing host media information, said method comprising:

reading the player media information from the media player;

comparing the player media information with the host media information from the host computer to produce comparison information;

determining which media items are to be copied between the media player and the host computer based on the comparison information; and

copying the determined media items to perform the synchronization.

19. A method as recited in claim 18, wherein the play media information and the host media information pertain to attributes of the media items.

20. A method as recited in claim 18, wherein the attributes include at least song title, album name and artist name.

21. A method as recited in claim 20, wherein the attributes further include quality characteristics.

22. A method as recited in claim 21, wherein the quality characteristics include at least one of bit rate, sample rate, equalization setting, volume adjustment, start/stop and total time.

23. A method as recited in claim 18, wherein said method further comprises:

identifying media items that are to be removed from the media player based on the comparison information; and

removing the identified media items from the media player.

24. A method as recited in claim 23, wherein the identified media items are those media items on the media player but not on the host computer.

25. A method as recited in claim 23, wherein the play media information and the host media information pertain to attributes and quality characteristics of the media items.

26. A method as recited in claim 25, wherein the attributes include at least song title, album name and artist name, and wherein the quality characteristics include at least one of bit rate, sample rate, equalization setting, volume adjustment, start/stop and total time.

27. A portable media player, comprising:

a storage disk that stores a plurality of media items;

a user input device that enables a user of said portable media player to at least select a particular media item from the plurality of media items;

a cache memory capable of storing at least one of the media items;

a media database that stores characteristics information for the media items stored to said storage disk and said cache memory; and

a processor operatively connected to said storage disk, said user input device, said cache memory and said media database, said processor controls said portable media player to store, remove and play the media items.

28. A portable media player as recited in claim 27, wherein said portable media player is battery-operated.

29. A portable media player as recited in claim 28, wherein said portable media player is an audio player, and wherein the media items are songs.

30. A media player wherein the improvement comprises a media database provided within said media player, the media database storing media information about media items stored on said media player.

31. A media player as recited in claim 30, wherein said media player is a handheld media player, and wherein the media items are audio items.

32. A computer readable medium including at least computer program code for synchronizing media contents of a media player with a host computer, said computer readable medium comprising:

computer program code for detecting connection of a media player to the host computer; and

computer program code for automatically synchronizing media content between the media player and the host computer once the connection has been detected.

33. A computer readable medium as recited in claim 32, wherein the media player includes a media database storing player media information, and wherein the host computer includes a media database storing host media information.

34. A computer readable medium as recited in claim 32, wherein said computer program code for synchronizing operates to compare the player media information with the host media information.

35. A computer readable medium including at least computer program code for synchronizing media items of a media player with a host computer, the media player storing player media information, and the host computer storing host media information, said computer readable medium comprising:

computer program code for reading the player media information from the media player;

computer program code for comparing the player media information with the host media information from the host computer to produce comparison information;

computer program code for determining which media items are to be copied between the media player and the host computer based on the comparison information; and

computer program code for copying the determined media items to perform the synchronization.

36. A computer readable medium as recited in claim 35, wherein the play media information and the host media information pertain to attributes of the media items.

37. A computer readable medium as recited in claim 36, wherein the attributes include at least song title, album name and artist name.

38. A computer readable medium as recited in claim 37, wherein the attributes further include quality characteristics.

39. A computer readable medium as recited in claim 38, wherein the quality characteristics include at least one of bit rate, sample rate, equalization setting, volume adjustment, start/stop and total time.

40. A computer readable medium as recited in claim 35, wherein said method further comprises:

computer program code for identifying media items that are to be removed from the media player based on the comparison information; and

computer program code for removing the identified media items from the media player.

41. A computer readable medium as recited in claim 40, wherein the identified media items are those media items on the media player but not on the host computer.

42. A computer readable medium as recited in claim 35, wherein the media player includes a first media database that stores the player media information, and the host computer includes a second media database that stores the host media information.

43. A computer readable medium as recited in claim 35, wherein the player media information and the host media information are obtained from metadata provided with the media items.

44. A computer readable medium as recited in claim 35, wherein the media player is a handheld media player.

45. A computer readable medium as recited in claim 44, wherein the media player comprises an audio player, and wherein the media content includes at least audio files of songs.

46. A computer readable medium as recited in claim 44, wherein the media player comprises a video player, and wherein the media content includes at least video files of videos.

47. A computer readable medium as recited in claim 44, wherein the media player comprises an image viewer, and wherein the media content includes at least image files of images.

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